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Relationship between Preeclampsia and Early Pregnancy Blood Lead Levels

Samira Mokhlesi[1], Siamak mohebi[2], Lida Moghadam Banaem[3*], Yaser Tabaraie[4]

1-M.Sc., Department of Midwifery & Reproductive Health, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran
2- Department of Public Health, School of Public Health, Qom University Medical Sciences, Qom, Iran
3-Assistant Professor, Department of Midwifery & Reproductive Health, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran
4- Department of Public Health, School of Public Health, Sabzevar University Medical Sciences, Sabzevar, Iran

Abstract: Preeclampsia is potentially life-threatening and dangerous complications of pregnancythis study were performed to assess the relationship between blood lead levels with preeclampsia. **Materials and Methods:** This longitudinal (prospective) study conducted on 1033 pregnant women who came to prenatal clinics of Tehran city, IRAN. The gestational age of mothers upon entry in the study was 14-20 weeks. Demographic questionnaire and reproductive history was completed and also a venous blood sample was taken from all the pregnant women upon entry. Preeclampsia was defined as blood pressure equal or more than 140/90 mmHg along with proteinuria after 20th week of pregnancy. **Results:** In present study, the incidence of preeclampsia was 1.9% .mean level of maternal blood lead was 4.7±4.9 µg/dl. There was a significant relationship between maternal blood lead levels and preeclampsia. **Conclusion:** The results of this study showed that the high blood lead levels in early pregnancy can causes preeclampsia and regard to importance of it to prevention of its complication, Its requires to more consideration and advise.

Keywords: Preeclampsia, Maternal blood lead levels, Pregnancy

1.Introduction

Preeclampsia is the common complication of pregnancy which is the most major causes of mortality in pregnant woman (other major causes is vaginal bleeding and infection) (1). This complication is the major problem in midwifery which causes perinatal morbidity and mortality in all over the world and its responsible for 15% of mortality of the mothers(2).The preeclampsia happens when the systolic blood pressure equal or more than 140mm/Hg and the diastolic blood pressure is equal or more than 90mm/Hg in two times whit 4-6 hour interval after 20th week and along with 300mg of protein exertion in the urine during 24hours or one plus or more in the detector devices (3). Maternal and perinatal outcome are depend on gestational age, disease severity, caring qualify, and medical disorders (4,5,6,7). The etiology and pathophysiology of preeclampsia is idiopathic and physicians have suggested several theories (8). The role of environment factors such as exposure to lead is important. In Vigeh et.al study (2005) increasing one log in concentration of lead in serum causes increasing the risk of preeclampsia in more times (9). In other studies there wasn't relationship between these factors (10). Lead is a heavy metal and with gray color, due to using this metal in all area of our environment, a little concentration of this metal exists in serum of the most of the people and also lead is a polluter of our environment and reuptakes by lungs and intestinal (11). Due to interesting of reabsorption of lead in pregnancy, the risk of fetal toxicity is increased (12). This metal can pass from placenta at 12th week and also can causes poor pregnancy outcome (13).WHO has suggested the normal range of the lead in pregnant women is 10 µg/dl (14). Several mechanism have been suggested for relationship between increasing level of lead and preeclampsia such as: I) Oxidation and inactivation of Nitric Oxide II) Over acting of sympathetic system and Noradrenergic and increase of beta adrenergic receptors III) Over activity of Angiotensin converter enzyme and increasing level of Renin, Angiotensin and Aldosterone IV) Overacting of kinase V) increasing products of TMX (15, 16, 17). According to severe complication of preeclampsia for mothers and their fetus, we have performed a study to identify relationship between preeclampsia and lead serum level and hope for promising results to triggering other studies.

2.Method

This study which is prospective has been performed in all pregnant women who came to perinatal clinics of Tehran city (after taking agreement). The samples were pregnant women who were at 14-20 week of gestational age. The samples conditions were: doesn't history of chronic diseases, age between 18-35 years old, single fetus pregnancy, doesn't history of smoking, alcohol and narcotic

substances. The questionnaire had required information such as demographic information, history of pregnancy, height, weight, blood pressure, passive smoking. The blood sample (1.5ml) was taken from cubital vein for detecting the levels of lead serum, if the mother had 140/90mmHg blood pressure or more and also proteinuria after 20th week, the preeclampsia was being suggested. The data was analyzed with Mann-Whitney and Logistic regression for assessment of relationship between the lead serum level and preeclampsia.

3.Results

The demographic information exist table (1). The most samples were at age 20-30 and they were housekeeper and high school graduated. The BMI of 51.3% of samples was 19.8-26. Preeclampsia detected in 1.9% of sampling. The different levels of lead serum exist in table2. The mean lead serum level was4.7±4.9µg/dl.The lead serum level in the most of the pregnant women was at normal range (lower than 10µg/dl) and only 116 persons (11.2%) were at abnormal range. The Mann-Whitney test was used for assessment of relationship between lead serum level and preeclampsia (table3). This showed the direct and significant relationship (P≤0.001). The logistic regression test was used for assessment of lead serum level along with factors that can potentially effects on preeclampsia. The effective variables were: The numbers of gravidity, BMI, passive smoking, mother age, history of preeclampsia and study grading levels. According to table 4 it was found there was significant and direct relationship between lead serum levels, history of preeclampsia, and passive smoking with preeclampsia.

4.Conclusion

Since preeclampsia is one of the most causes of maternal mortality, attention to this matter is very important. Mean lead serum level was4.7±4.9µg/dl. Moghadam et.al (2009) had reported that this variable was5.46±4.78µg/dl (in Tehran city) (18). One study that has been performed in England has reported this variable was 5.96±2.52µg/dl (2003) (19). And in another study in Iraq (2004) this variable was 4.03±2.9µg/dl (20) that the result of this study was close to our study due to similar climate and other conditions. One study which has been performed in Germany (2001) has reported that this variable was 2.75µg/dl (21). Chien et.al reported (2010) this variable was 1.58±1.11 µg/dl in their study (in Taiwan) (22). The differences of this variables in different countries maybe was due to different time of blood sampling (different trimester)

Table 1: Characteristics of the study subjects (n=1033)

variable		Number	Percentage (%)
Occupation	housekeeper	896	86.7
	employee	137	13.3
Age	‹20	72	7
	20-30	748	72.4
	31-35	213	20.6
Education	elementary	117	11.3
	secondary	112	10.8
	High school	524	50.8
	university	280	27.1
Gravity	1	551	53.3
	2	328	31.8
	›2	154	14.9
Passive smoking	yes	128	12.4
	no	905	87.6
Body mass index in first visit (kg/m2)	‹19.8	88	5.8
	19.8-26	530	51.3
	26-29	220	21.3
	›29	194	18.8

Table 2: range of blood lead level (low, moderate, high) of the study subjects.

variable	Number	Percentage (%)
Low level (<µg / dl10)	917	88.8
Moderate level (10-µg / dl20)	94	9.1
High level (>µg / dl20)	22	2.1

Table 3: Relationship between blood lead levels with preeclampsia

Variable (µg/dl)	preeclampsia		P-vlaue MannWhitney
	yes	no	
Blood lead level(Mean±SD)	7.87±4.61	4.63±4.8	0.0001

and also was because of different climate and polluter of environment and diet and social economic condition. In our study there was a significant relationship between lead serum level and preeclampsia. One study which was performed in France (2009) with 1017 samples, has reported the lead serum level was more than normal range in pregnant women with preeclampsia (16). In another case-control study that was performed in Texas (1999), the toxic metal levels have been measured in amniotic fluid of 101 normal pregnant and 129 pregnant women with preeclampsia. The lead serum level was increased 68% and 57% in first trimester

Table 4: Possible risk factors for preeclampsia: results of logistic regression analysis.

variable	OR	CI 95%		P-value Logistic regression analysis
		lower	higher	
gravity	1.11	0.73	1.69	0.60
BMIin first visit	1.0	0.90	1.10	0.90
Blood lead level	1.01	1.02	1.16	0.0006
Passive smoking	4.21	1.58	11.25	0.004
age	1.04	0.92	1.16	0.50
Previous preeclampsia history	12.25	1.16	129.16	0.03
Education	1.00	0.87	1.14	0.98

and third trimester respectively (in pregnant women with preeclampsia)(23). One case report has been reported by Barbara (2003) that one 33 years old pregnant women with history of pica had vaginal delivery due to preeclampsia in 38th week (the early lead serum level was 26µg/dl)(24). All of these studies had similar results to our study that can confirm the relationship between lead serum level and preeclampsia. In contrast, one study that was performed on 4354 pregnant women in New York (1979-1981) there was not relationship between the lead serum level in umbilical cord blood and preeclampsia (10). And also one study has been performed by Rothenberg et.al ,the effect of lead bone on pregnancy hypertension has been assessed but there was not any relationship between the lead serum level and hypertension of pregnancy in third trimester (25). The difference of these studies and our study maybe was due to different manner of blood sampling. For example in those studies the lead levels have been measured in bone and umbilical cord blood. The logistic regression test has been used for assessment of maternal lead serum level and factors which effect on preeclampsia simultaneously and was showed that there was significant relationship between lead serum level, history of preeclampsia, passive smoking with preeclampsia (3). In one study which was performed by Hsien et.al in Taiwan, the risk of preeclampsia has been increased in mothers who had history of preeclampsia (OR: 6.3 95% CI: 4.4-9.2) (26). And also another study by Deis et.al (2008) in France, has reported similar results (OR:5.08 95% CI:2.89-8.92) (27). At the end our study showed that increasing the lead serum level can induce preeclampsia therefore it is necessary to inform all if the target groups to performing required actions to prevent the risk of the high lead serum level on mother and her fetus in pregnancy.

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